ASD VACUUM GROUP

- Secretary — Pat McUmber
- Engineers — Kevin Beczek, Steve Berg, Joe Gagliano, Dean Walters
- Scientists — Richard Rosenberg, Qing Ma
- 11 Technicians
- Vacuum Lab
- Surface Science Lab(s)
- Vacuum Factory (382)

OUR MISSION

"To Support the APS During Operations and Machine Access Periods"

Operations Periods

- Respond To Downtime Incidents
- Maintain Vacuum Spares
- Monitor Vacuum Systems of All Accelerators
- Prepare For Next Access Period

Access Periods

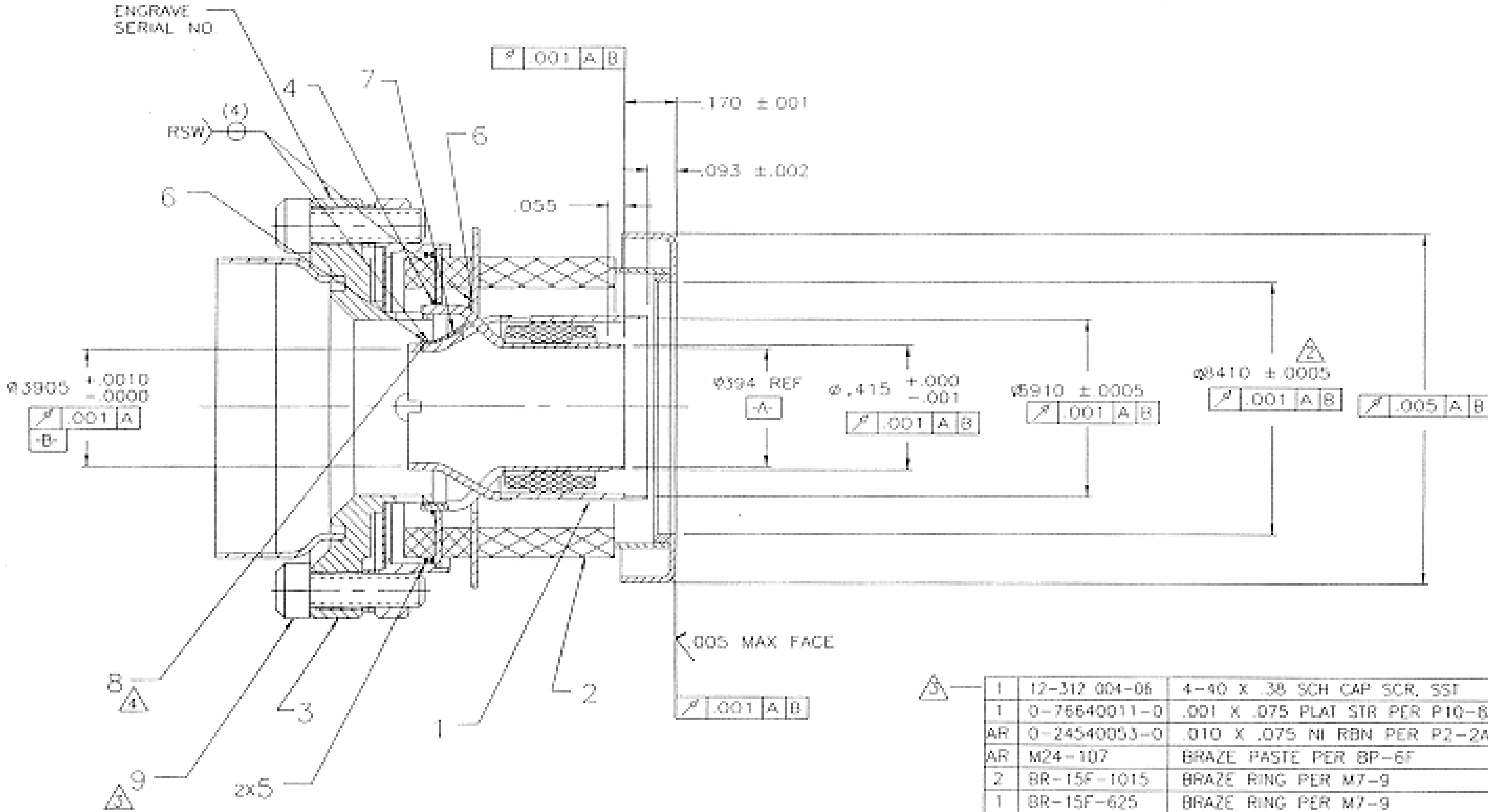
- Routine Maintenance On Vacuum Systems Hardware
- Installation of Machine And R&D Upgrades

VACUUM OPERATIONS

- Linac Bunch - Compressor
- SRRF Cavity Vacuum (in cooperation with Controls Group)
- RF Gun 1 & 2 Spares
- Main Injector Upgrade
- Gun Test Stand
- Waveguide Switching
- Linac Energy Upgrade

Aug 24, 2000

REVISIONS					
ZONE	REV	DESCRIPTION	ECO	DATE	APPROVED
	R	REV-RDWN W BOARD DRWG	401867	1-15-90	LCC



QTY	IDENTIFYING NUMBER	DESCRIPTION	ITEM
1	12-312 004-06	4-40 X .38 SCH CAP SCR, SST	9
1	0-76640011-0	.001 X .075 PLAT STR PER P10-6A	8
AR	0-24540053-0	.010 X .075 NI RBN PER P2-2A	7
AR	M24-107	BRAZE PASTE PER BP-6F	6
2	BR-15F-1015	BRAZE RING PER M7-9	5
1	BR-15F-625	BRAZE RING PER M7-9	4
1	108943	DIAPHRAGM ASSY	3
1	108942	HV SEAL ASSY	2
1	055793	GRID INSULATOR ASSY	1

LIST OF MATERIALS

1. MAKE PER M7-13.
2. BACK BORE ø.841 TO PREVENT PRODUCING BURR ON INSIDE CORNER.
3. REPLACE WITH AQUADAG COATED SCREWS AFTER BRAZE.
4. SPOTWELD PLATINUM STRIP TO GRID INSULATOR, THEN SPOTWELD NICKEL RIBBON TO PLATINUM STRIP
5. PROCESS PER OS

Communications & Power Industries
MICROWAVE POWER PRODUCTS EIMAC OPERATION
PALO ALTO, CALIFORNIA

DR L. CAYABYAB 1-15-90
CHK
APPD
APPD
MATERIAL
DESIGN ACTIVITY APPROVAL
CUSTOMER APPROVAL
PER

ADJUSTABLE H.V. SEAL ASSY

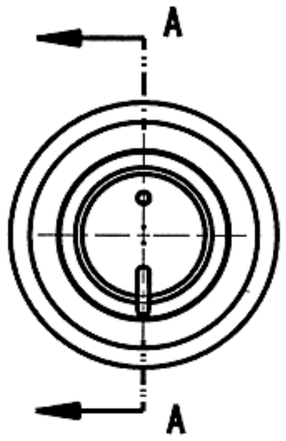
SIZE C | FSCM NO 0MH33 | 108941 | R
SCALE 4/1 | SHEET | OF

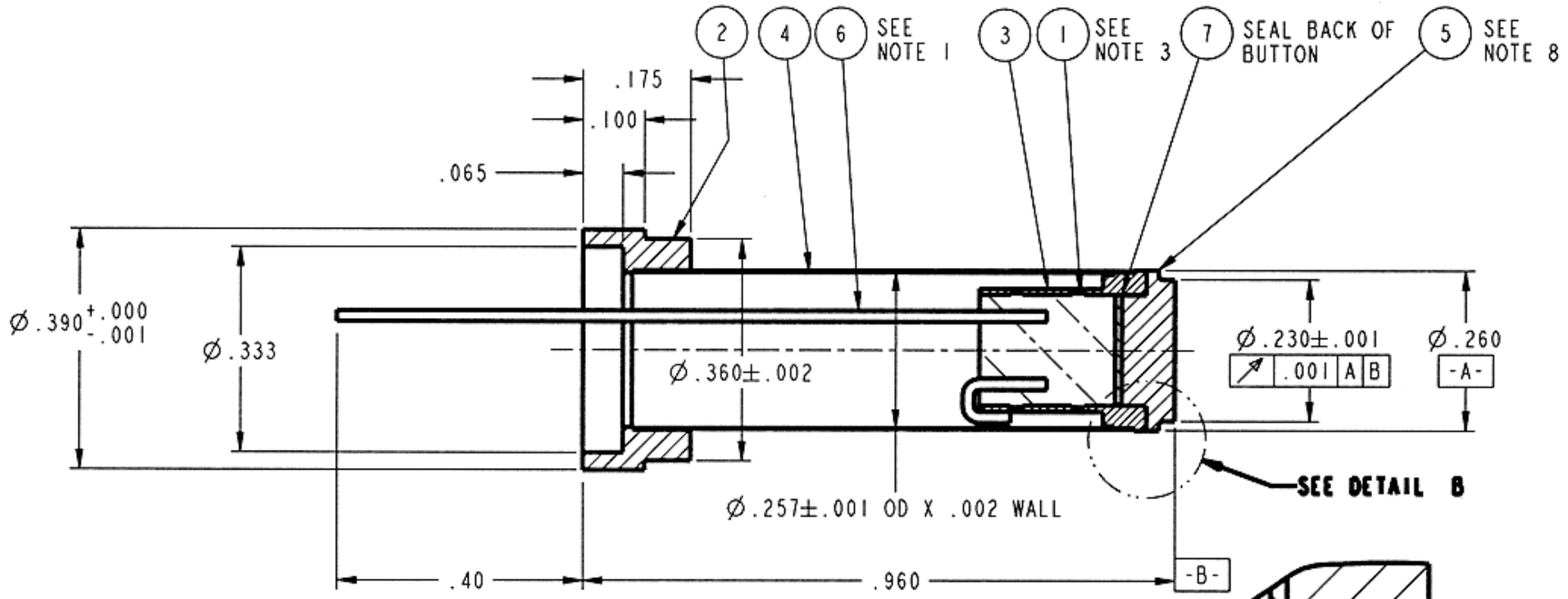
SUPERSEDES

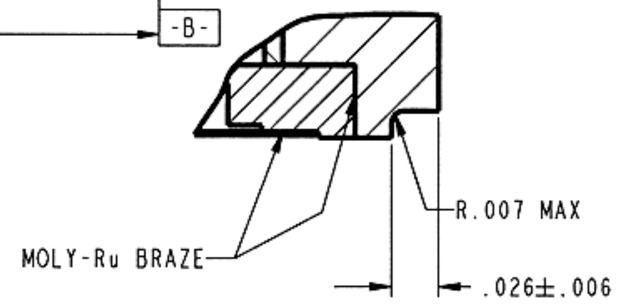
C 108941

REVISIONS					
ZONE	REV	DESCRIPTION	BY	APPROVED	DATE

SCALE 1:1







DETAIL B
SCALE 16:1

NOTES:

1. SPIRAL WRAP HEATER LEAD ITEM 6 WITH .005 DIA Mo(97%)-Re(3%) -TOTAL: .019 DIA
2. TYPE S IMPREGNATE (41180)
3. NONINDUCTIVE POTTED HEATER, POTTING TO BE LESS THAN 99% PURE AL_2O_3 (HEATER TO OPERATE AT 6.5V RMS SQ. WAVE AT 40 KHz)
4. WHEN ASSEMBLY AS SHOWN IS OPERATED IN VACUUM WITH 6.3 VOLTS APPLIED, TEMP TO 1100°C BRITE AND I=2.7 AMPS MAX. AND 1.6 AMPS MIN. HEATER COLD RES.=.47-.48Ω
5. SOURCE CONTROL DWG. APPROVED SOURCE: SEMICON P/N 0001128, MODIFIED AS SHOWN.
6. REFERENCE: VARIAN ASSOCIATES, TUBE DIVISON DWG: CODE ID NO. 99313. MAT'L: 55690
7. "TA" SPUTTER COAT 4000-6000 A° OF OS-RU (SEMICON USUALLY JUST PUTS A "TA" COATING ON (W, O, RU))
8. NOTE THE CATHODE IS FLAT (INFINITE SPHERICAL RADIUS)
9. CATHODE NEEDS TO BE ACTIVATED IN VACUUM BEFORE RUNNING. RAISE TEMPERATURE TO AT LEAST 1100°C (1200°C PREFERABLY)
10. TOLERANCE IS SUPERSEDED BY .XXX = ±.005

ITEM	DRAWING/PART NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL/SPEC	QTY
7	S10442	SEAL (NO DWG)	W/MOLY-Ru	1
6	S10463	HEATER LEAD .009 DIA	W WITH 3% Re	1
5	S10464	BUTTON	TYPE S TUNGSTEN	1
4	S10462	CYLINDER	MOLY-Re50/50	1
3	S10440	POT CYLINDER	MOLY	1
2	S10465	FLANGE MOUNT	MOLY	1
1	S10444	POTTING (NO DWG)	ALUMINUM OXIDE	1

PARTS LIST/BILL OF MATERIALS

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES
TOLERANCES
DECIMALS .X ±.1, .XX ±.03, .XXX ±.010
ANGULAR ±.5°
SURFACE ROUGHNESS 125

REMOVE ALL BURRS AND BREAK SHARP EDGES .03 MAX. SURFACE TEXTURE TO BE IN ACCORDANCE WITH LATEST ANSI B46.1 DIMENSIONING & TOLERANCING IN ACCORDANCE WITH LATEST ANSI Y14.5

MODEL NAME: S10461

ELECTRONIC FILE NAME: S1046100

DRAWN BY: C. PITTS — DATE: 25-Jul-00
CHECKED BY: — DATE:
DESIGNED BY: C. PITTS — DATE: 25-Jul-00
RESPONSIBLE ENGINEER: K. BECZEK — DATE:
GROUP LEADER: G. GEOPPNER — DATE:
APPROVED BY: — DATE:

RELEASE LEVEL: ENG-RELEASE — VERSION: 0

MATERIAL: SEE PART LIST & NOTES

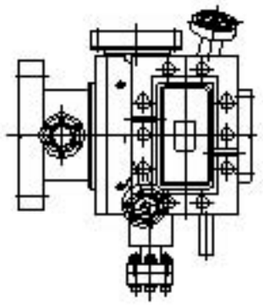
THIS DRAWING IS THE PROPERTY OF
ARGONNE NATIONAL LABORATORY
ADVANCED PHOTON SOURCE

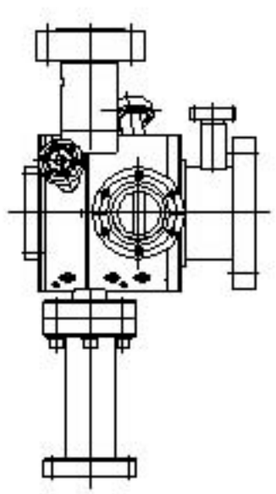
TITLE:
CATHODE ASSEMBLY

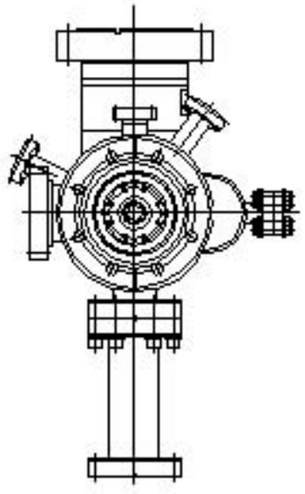
AET TYPE NO. IC CATHODE ASSEMBLY

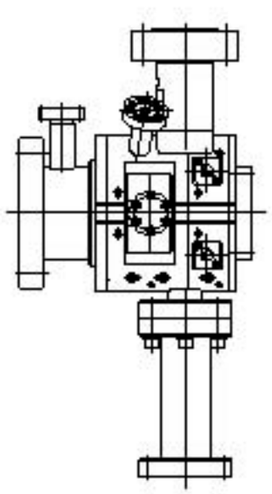
SIZE C | FSCM No OHRH5 | DRAWING NUMBER: S10461 | REV. 00

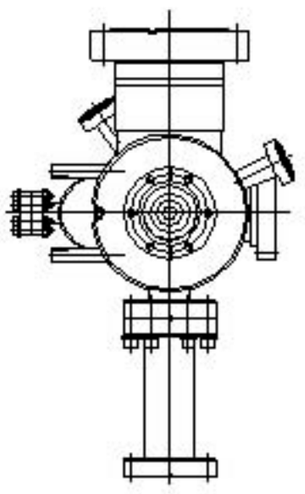
SCALE: 6:1 | DO NOT SCALE DRAWING | SHEET 1 OF 1

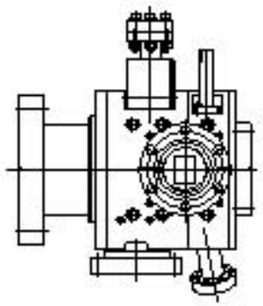


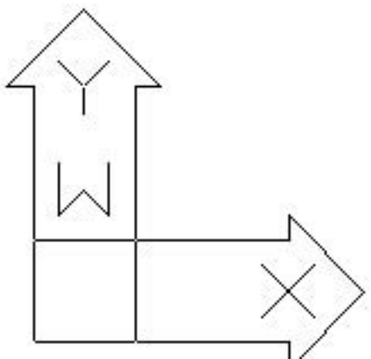








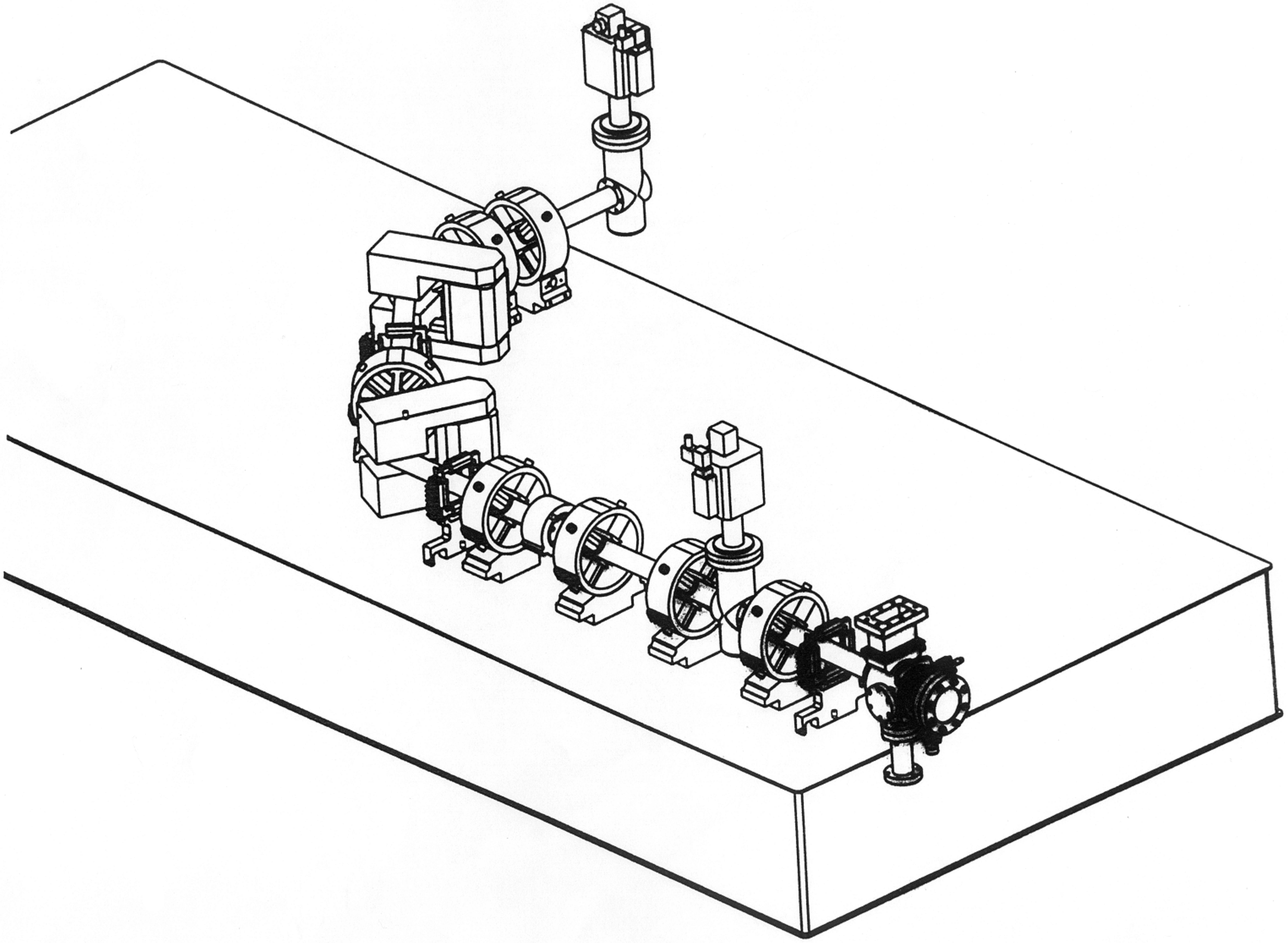




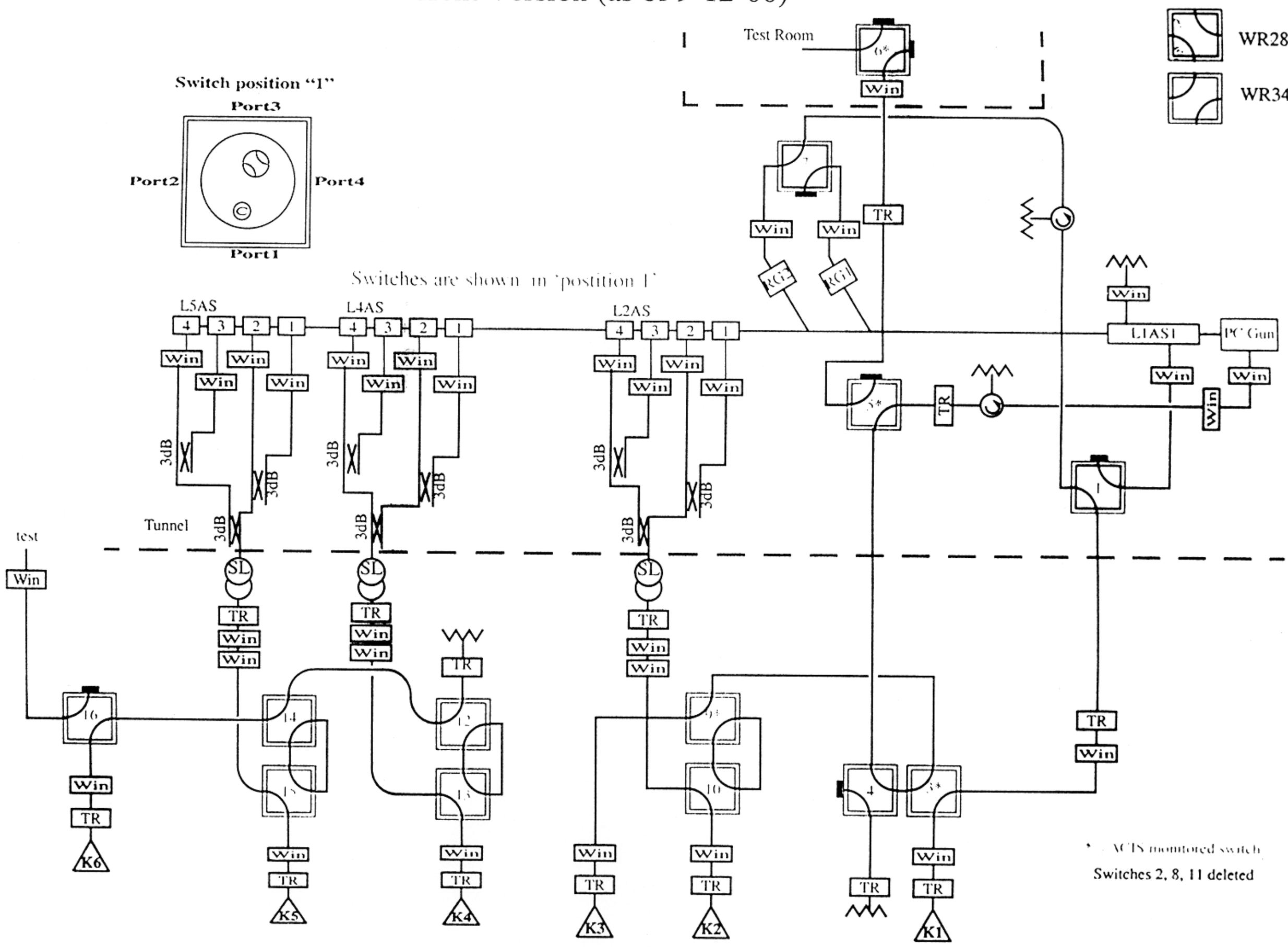
?P?Ê mm

CAV-03-RF-Gun-S1.5

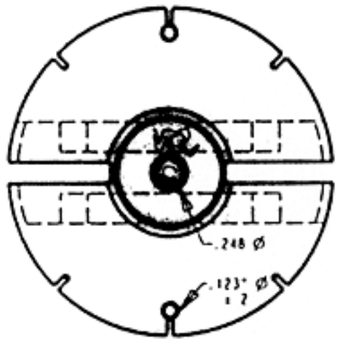
RF Gun
3-076120



Current Version (as of 9-12-00)



284 SECTOR ROTOR



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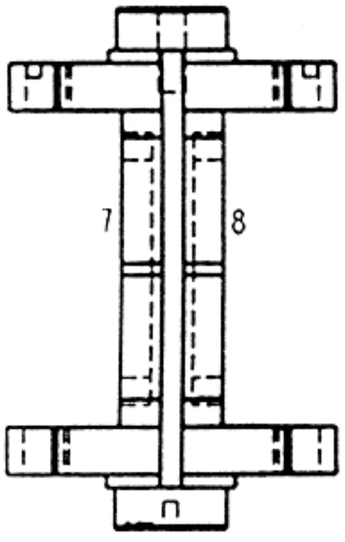
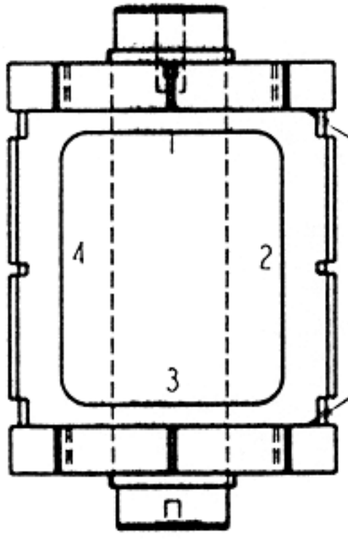
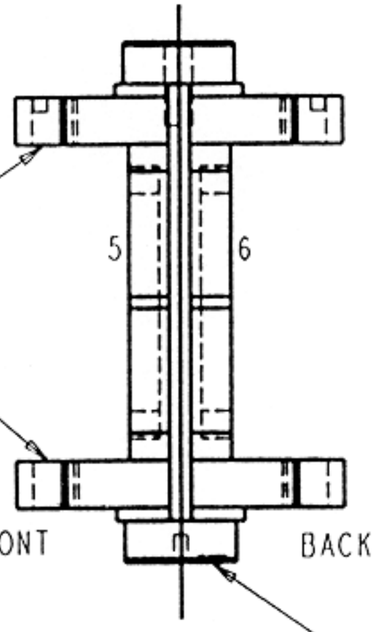


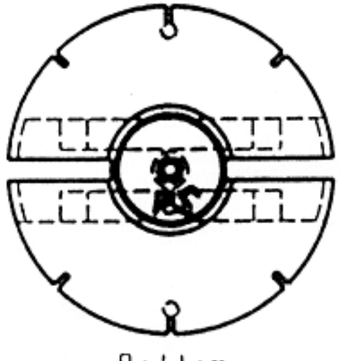
Left Side

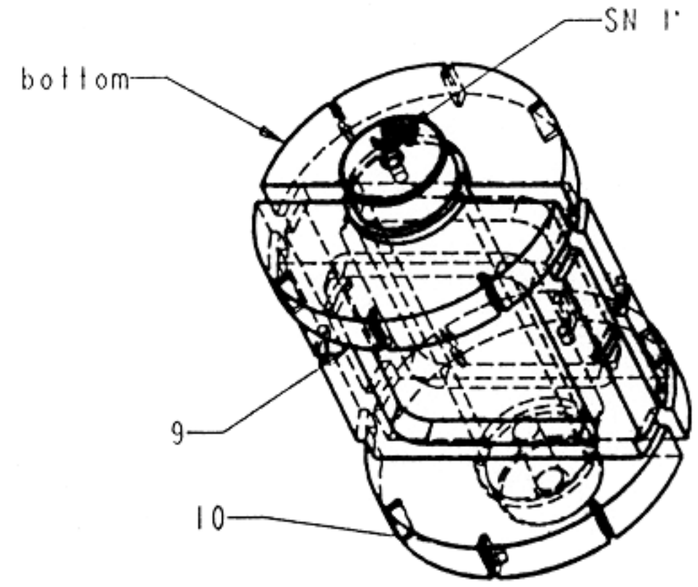


Front



Right Side


Bottom



SCALE 0.750

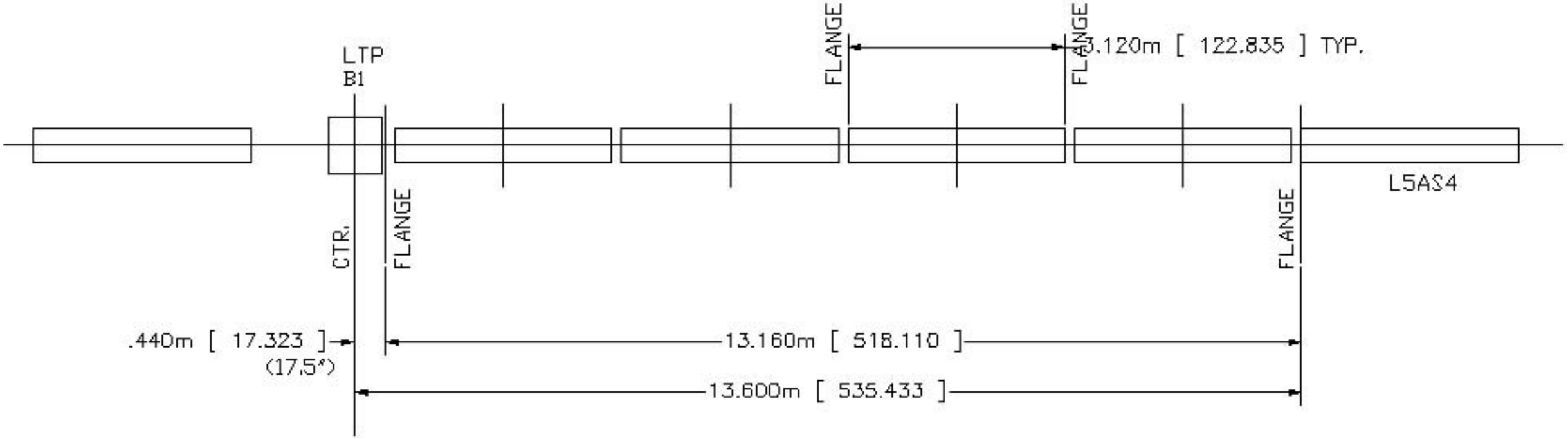
Inspection 363 CTS under T. Barsz/K. Wood direction
carefully scribe serial number SN 1, SN 2, etc.
as shown on back side bottom prong.
Then measure using molding compound
and optical comparator edges 1 - 10 for
A. unreworked stage B. reworked stage

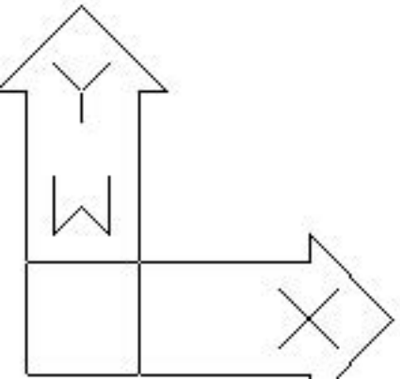
SERIAL NUMBER SN1, SN2, SN3,
SCRIBED ON BACK SIDE BOTTOM PRONG

sk284sector_rotor1.drw

Steve Berg 4-1889 2916

FOR 850 MEV-



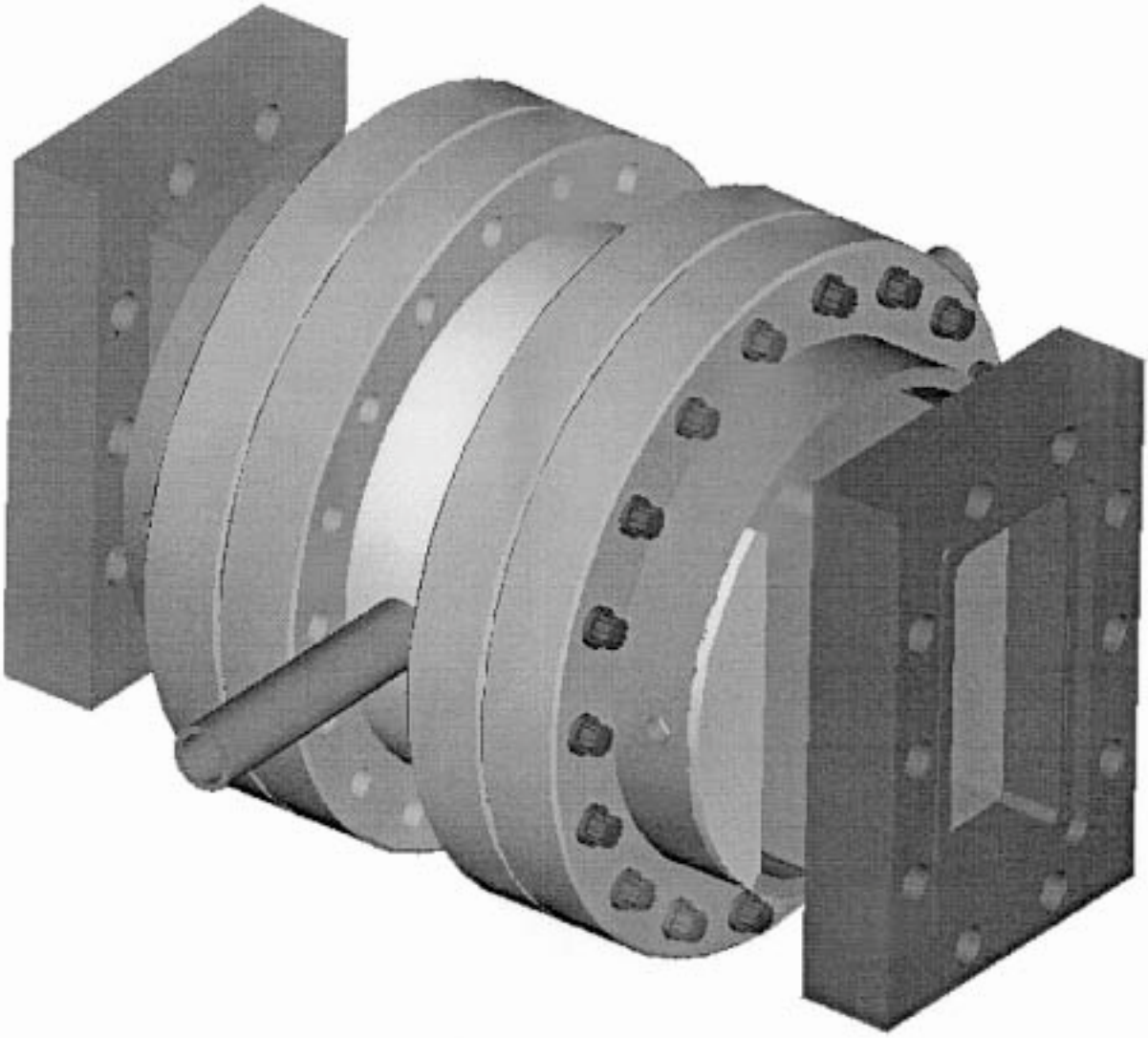


3.12 X 4 = 12.48m

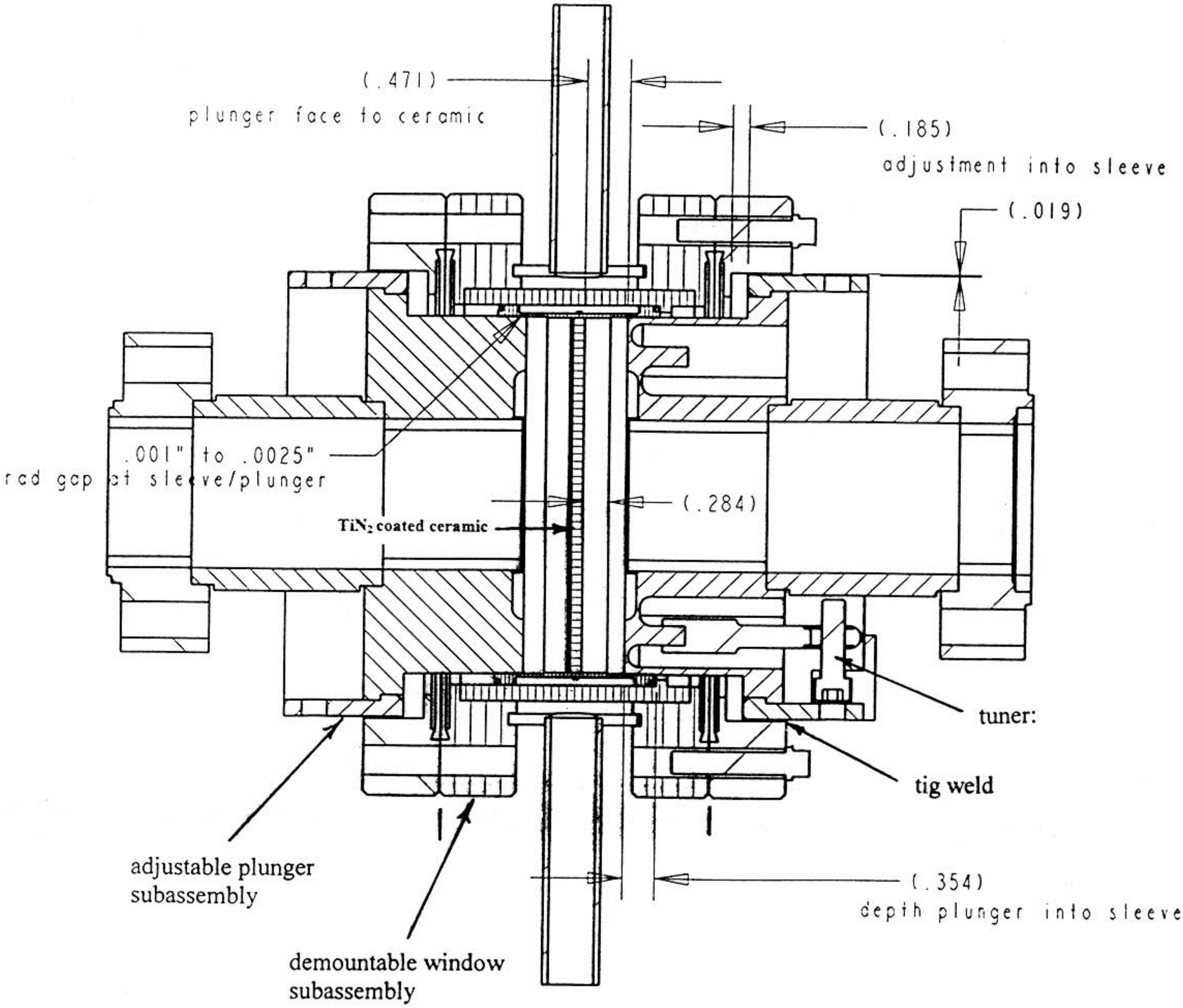
13.16 - 12.48 = .68m/5
= .136m FOR EACH BPM/BELLOWS ASSY.
(5.35°) AND MAGNET

VACUUM R&D

- Tuneable 340 RF Window
- Aluminum Gasket Evaluation
- Sector Bakeout Refinement
- Thin-Film Deposition
  - Titanium Coating of Tuners and Sample Work for BNL/SNS
- Plasma Window (BNL) with ME Group



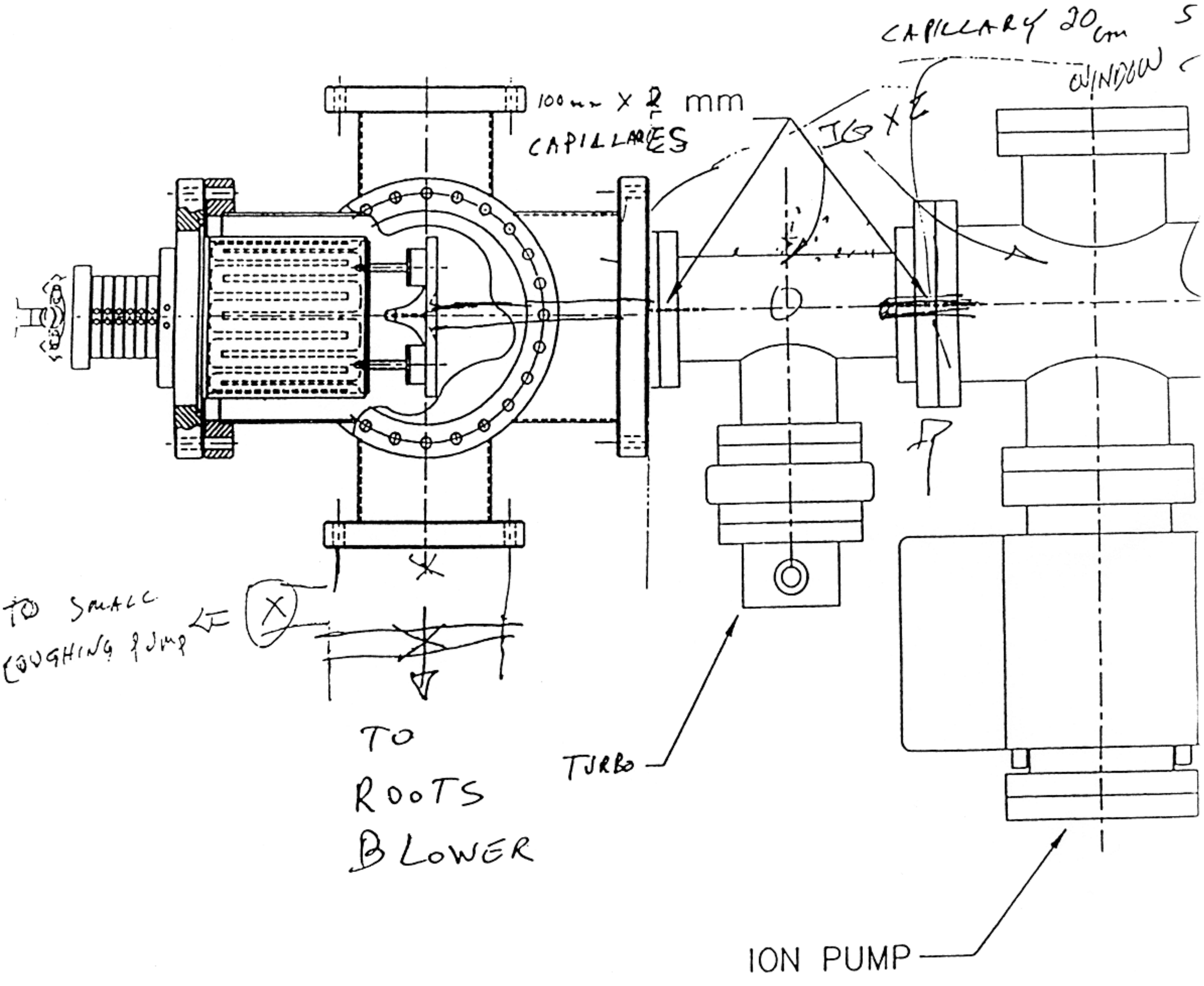
340 WINDOW
40 dB target reflected power


(.471)
plunger face to ceramic
(.185)
adjustment into sleeve
(.019)
.001" to .0025"
rcd gap at sleeve/plunger
(.284)
TiN2 coated ceramic
tuner:
tig weld
adjustable plunger
subassembly
demountable window
subassembly
(.354)
depth plunger into sleeve

340 WINDOW

PLASMA WINDOW

- Vacuum-To-Atmosphere Interface
- Allows X-Ray Transmission
- Low Attenuation, High Efficiency Tranport
- Defect Free, No Thermal Damage
- May Be Suitable As A Fast Acting Beamline Valve


CAPILLARY 20 cm
WINDOW
100 mm X 2 mm
CAPILLARIES
IG
TO SMALL
ROUGHING PUMP
TO
ROOTS
BLOWER
TURBO
ION PUMP

VACUUM SURFACE SCIENCE

- Electron Cloud Studies
- SPIRIT End Station
- SAFARI Center

Electron Cloud Studies

- Over the past several years a program of studies has been underway aimed at understanding the properties of the electron cloud in the APS storage ring.
- A rudimentary electron energy analyzer was developed to study the intensity and energy distribution of the electrons in the ring. This detector has been adopted by other scientists studying this phenomenon at other laboratories.
- Results of our studies show how the properties of the electron cloud depend on the intensity and spacing of the electron or positron bunches in the ring.
- Sample coupons were installed in the sector 30 chamber 6 months ago. The first of these coupons were just removed and will be analyzed to determine how the electrons induce surface chemical changes.
- A second generation (Bessel Box) detector was developed and ray tracing calculations were performed. Two of these detectors were just installed in sector 30.

SPIRIT End Station

- SPIRIT (single-photon ionization *or* resonant ionization to threshold) end station will be utilized to analyze neutral species desorbing from surfaces.
- Advantages of using light from LEUTL line are high intensity and tunability in the ultraviolet region. These attributes are not found in conventional lasers.
- Areas of interest include:
  - Desorption from cryogenic surfaces (superconducting accelerators and RF cavities).
  - Trace impurities and dopants in silicon.
  - Self assembled monolayers.
  - Nucleic acid chain desorption, ionization, and fragmentation.

Surface Analysis For Accelerator Research and Innovation

Background

- Today there are many areas of accelerator technology where a lack of understanding of surface physical and chemical phenomena is limiting the performance of present and planned ANL projects and collaboration.
- Chief among these is the understanding of the surface chemistry of Nb and other potential superconducting materials that are required for advanced rf cavities.
- Other areas include: (1) understanding the surface chemical changes that occur as the result of photon or electron irradiation of the surfaces of accelerator components in vacuum; (2) developing new coatings to minimize secondary electron effects in accelerators; (3) understanding the surface diffusion effects that may occur on beam-position monitors as the result of x-ray irradiation; (4) development of improved photocathode materials; (5) development of *in situ* methods to diagnose surface chemical and physical changes.

Approach

- The overall objective of this proposal is to initiate the formation of a Surface Analysis For Accelerator Research and Innovation (SAFARI) Center, which would serve not only as a laboratory dedicated to accelerator-related surface science, but also as a resource that researchers throughout the accelerator community could utilize.
- The most pressing need is the understanding of the surface chemistry of Nb as it relates to SC RF technology. We plan to devote most of our resources towards this end. During the coming year we will construct an apparatus for studies on both very low temperature (~10 K) and very high temperatures surfaces (~2100 K). We will examine the effects of chemical and thermal treatment and particle bombardment on the surface chemical and electronic structure using x-ray photoelectron spectroscopy, scanning Auger microscopy, and secondary electron yield measurements.
- We will establish collaborations with other labs working in the field with the objective of putting our knowledge to practice.

VACUUM FACTORY

- **WORK FOR OTHERS PROGRAMS**
  - LBL Chambers (PEP II)
  - KEK Copper Chambers
  - BESSY II ID Chambers
  - FERMI NUMI Horn
  - (BNL/SNS Chambers)

- **UHV FABRICATION FACILITY**
  - Cleaning
  - Welding
  - Leak Checking
  - Assembly (Class 100 Clean Room)
  - Vacuum Oven (500 C^{o} @ $10\text{-}6^{-6}$)